Characterization of livestock production systems and the potential of feed-based interventions to improve livestock productivity in Teso South sub-county, Kenya

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The Feed the Future Kenya Accelerated Value Chain Development (AVCD) program seeks to widely apply technologies and innovations for livestock, dairy and staple crop (root crops and drought-tolerant crops) value chains in order to competitively and sustainably increase productivity, contributing to inclusive agricultural growth, nutrition and food security in 23 counties in the country. Supported by the United States Agency for International Development as part of the US government's Feed the Future initiative, its main goals is to sustainably reduce poverty and hunger in the Feed the Future zones of influence in Kenya.

In partnership with the International Crops for Research Institute for Semi-Arid Arid Tropics (ICRISAT) and the International Potato Center (CIP), International Livestock Research Institute (ILRI) will lead the implementation of AVCD. The three CGIAR centres will work closely with partners—county governments, NGOs, CBOs, private sector actors and other USAID-funded projects/programs, as well as leverage knowledge and best practices from academic institutions and foundations.

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Introduction

Feed is the single most important factor affecting smallholder livestock production. The Feed Assessment Tool (FEAST) was used and developed by ILRI (2015) to collect data on farming systems, cropping patterns, livestock management and feed availability. The objective was to get a rapid on-site assessment of the livestock feed situation in the sub-County and to develop strategic interventions in order to address any inadequacies in feed supply.

Methodology

Location

Teso South is located in Busia County bordering Uganda to the West, Teso North sub-County to the North, Bungoma County to the East and Nambale sub-County to the south. The sub-County has a total area of 299.8 km^2 with an arable area of 223 km^2 and a human population of about 138,000 people. The rainfall pattern is bimodal ranging from 1000mm-1500mm and temperature range is 14^0C- 30^0C while altitude range is 1200- 1500 m a.s.l. Agro-ecological zones in the area are Low Midland 1 (LM1), Low Midland 2 (LM2) and Low Midland 3 (LM3).

Data collection

The Feed Assessment Tool (FEAST) was used to collect data from the focus group discussion (FGD) and individual interviews. The FGD was carried out with 16 farmers drawn from four of the six wards of Teso South sub-County and Busia County. This was conducted on 2nd June 2016 in Simba Chai market of Amukura Central ward.

The participants included 10 men and 12 women, and 3 college students on field attachment (2 male and 1 female). A technical team comprising of 2 male officers and 1 female private service provider were also included.

Results and discussions

General farming system

Farmers practise mixed crop and livestock system. The average farm size is 1.21 ha, but some farmers own as little as 0.1 ha, while a few others own up to more than 6.1 ha (Table 1). About 90% of the farmers own 0.1-2 ha of land. There is a increasing pressure on land in the rural areas. Land tenure is mainly free with a few areas falling under trust land. The trust is held by the County Government for areas proposed for the development of public institution and social amenities. There are no gazetted forests and reserves. The land area available for cultivation is decreasing due to demand for other land uses and land subdivision due to population increase. Settlement is taking up more land so that the available land is used to grow more than one crop per year. Fallowing is still practised and allows the soil to regenerate or create a grazing block. However, land left to fallow forms only 10% and continues to shrink. The cost of leasing land varies from KSH 5000 to KSH 8000 (US$ 50 to US $ 80) per 0.4 ha depending on the locality, potential and proximity to the market or road. The land around urban centres is more expensive than in rural areas. Areas along the fertile

riverbanks are also more expensive than land comprised of sandy or lateritic soils. According to the FGD, an average of 20% of the arable land may be allocated to fodder production, 30% to subsistence and 50% to cash crops in a typical household. There is not enough land to support extensive livestock rearing system, but land for cultivation is still available. Forage production can increase when income can be generated from fodder production.

Table 1: Household landholding categories by land size in Teso South sub-county

Category	Range of land size (ha)	% of households
Small	0.1-1.2	40
Medium	1.2-2	50
Large	2-4.1	10

Family size

On average, a household comprises of 6 members. These include the husband, wife and 4 children. During most of the year, around 5% of the children/youths leave in search of better livelihoods (education and employment).

Rainfall and cropping pattern

Teso South sub-County receives rainfall in a bi-modal pattern. The long rainfall season runs from March to June, peaking in May, while the short rainfall season falls between August and October, peaking in September. Due to climate change, the rainfall pattern is unpredictable and unreliable. For example, sometimes the short rains extend into December and the onset of the long rains delaying until April. The period of December- March is usually hot and dry and livestock feeds become scarce (Figure 1).

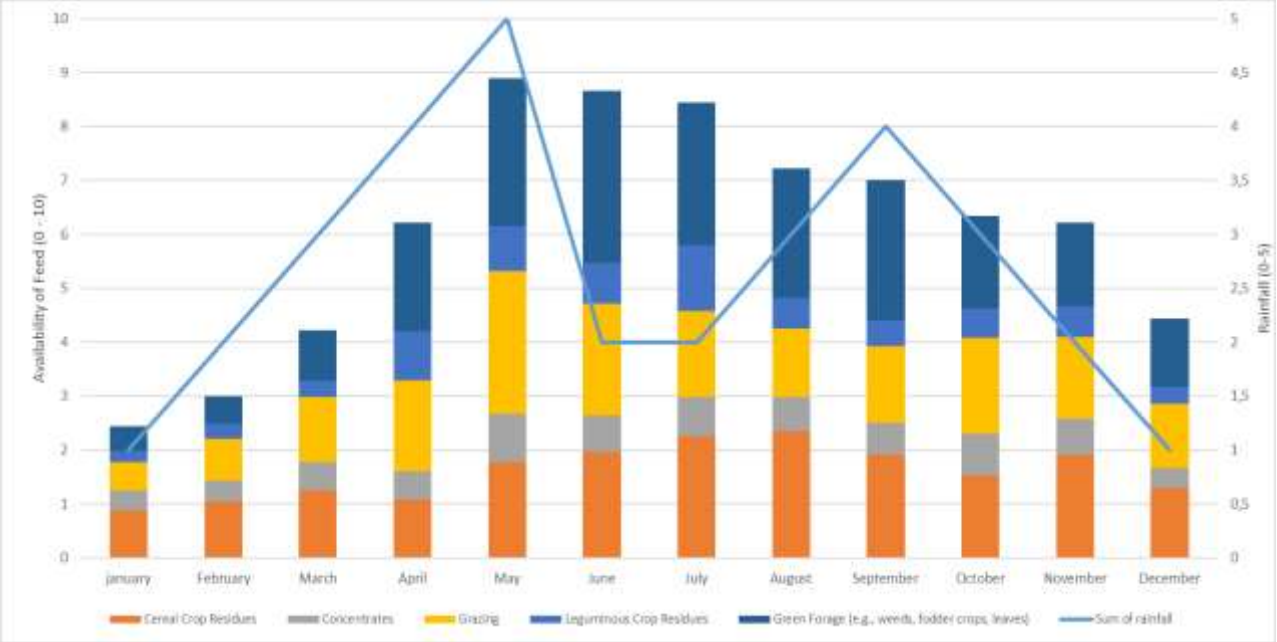

Figure 1: Annual rainfall pattern and corresponding livestock feed availability

Sorghum is the most dominant crop in the sub-County. The long rainy season supports the production of maize, beans, finger millet, rice and fodder crops. The short rainy season, known as "*akasweete*", supports the growth of sorghum, soya, maize and sweet potatoes (Figure 2). From November to mid-March, during the dry spell "akamiu", there is little cropping activity.

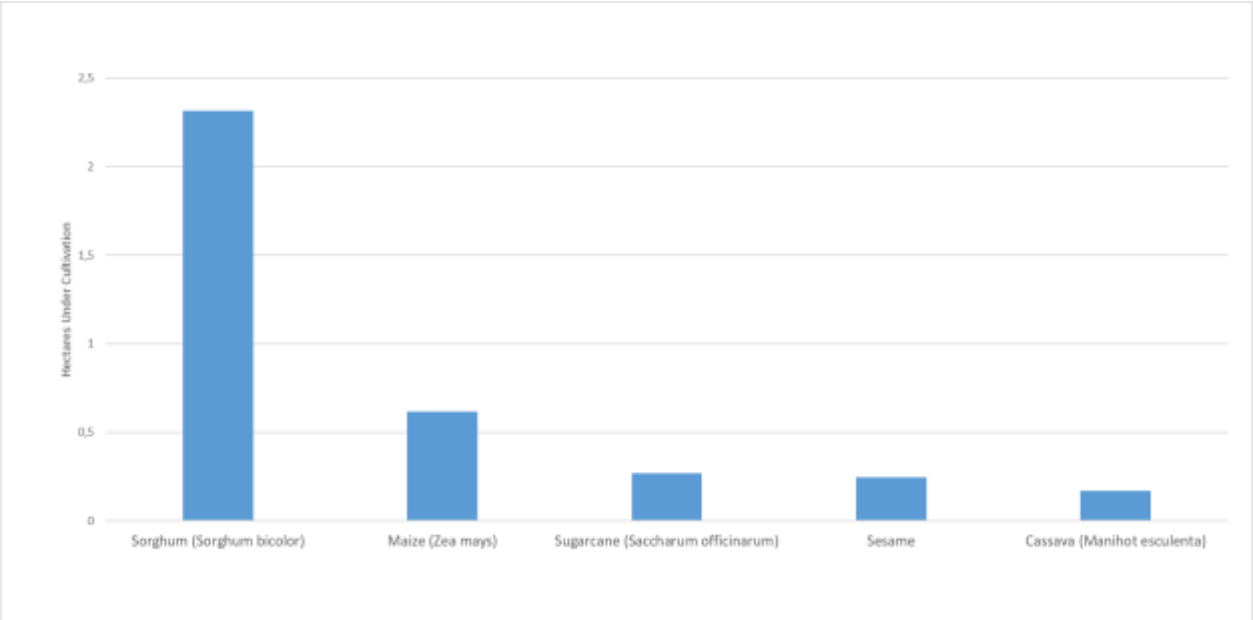

Figure 2: Dominant crop types by average hectares cultivated

Availability of water and irrigation

About 72% of the households studied in the area have access to water. Water availability for livestock is 75%. The availability is highest in Amukura central ward and decreases towards Angorom ward. The available water sources include streams, shallow wells, boreholes, natural springs and piped water systems. The streams, shallow wells and some springs dry up during the long spells of the dry season. Piped water systems are found around the urban centres of Busia (Angorom ward), Amukura and Simbachai. Ward development has contributed to more shallow wells in Amukura central ward, and therefore water is more available to the population compared to other wards. During the rainy season, water is available, and livestock travels up to 1 km to access water points. In the dry season, some water points dry up and livestock travel up to 2 km in search of water.

Irrigation is not widely practised in the area and only about 7% of the households have access to drip irrigation, overhead and by use of watering cans. Irrigated crops include vegetables, tree seedlings growing in nurseries and fruit trees.

Labour requirements

The demand for labour on the farm is highest during the onset of the long rains. Labour is required for land preparation, planting, weeding and pest control. Land preparation using oxen is done by men while the rest of the operations are carried out by both men and women in varying proportions, with women doing about 75% of the farm work. The cost of labour across the year varies from KSH 200 to KSH 300 (US $ 2 to US $3) per day and there is no wage difference across gender. The labour costs are affordable to the majority of the households. Households that cannot afford labour charges organize themselves into working groups that do work in rotation.

There is a shortage of labour during peak cropping seasons due to people leaving in search for better livelihoods. Labour shortage is prevalent among dairy farmers and it occurs throughout the year. The youth prefer lighter tasks such as motorbike riding to labour-intensive ones.

Hiring workers depends on one's ability to pay the cost, the hospitality of the host, the type of enterprise/crop and the condition of the farm. Workers tend to avoid hosts that are rude and less hospitable and t prefer hosts that provide food in addition to payment. They also avoid crops like sugar cane and pineapples that are coarse on the skin.

Types of livestock

Livestock species are mainly kept for meat and egg production for household consumption (Table 2). Most of the eggs consumed in sub-County are imported from Uganda. The farmers are not competitive due to high production feed and other costs hence cannot breakeven.

When expressed on TLU (Tropical Livestock Unit) basis, the most dominant livestock species kept in the area are improved dairy cows, local dairy cows, and pigs (Figure 3). On headcount basis, the most dominant species are poultry maintained under the village and commercial farms.

Table 2: Livestock species owned by households

Livestock type	Primary uses	Households (%)	Av. No. of animals /household
Local dairy cows	Milk, Meat, Dowry, manure, Hides, income	80	5
Improved dairy cows	Milk, Meat, manure, Hides, income, replacement stock	15	2
Sheep	Meat, manure, income, skin	30	3
Goats	Meat, manure, income, skin, dowry	40	5
Pigs	Pork, Income, manure	70	5
Poultry –village	Meat, income, eggs, manure	90	10
Poultry commercial	Eggs, meat, income, manure	5	300
Donkeys	Transport	0.1	1

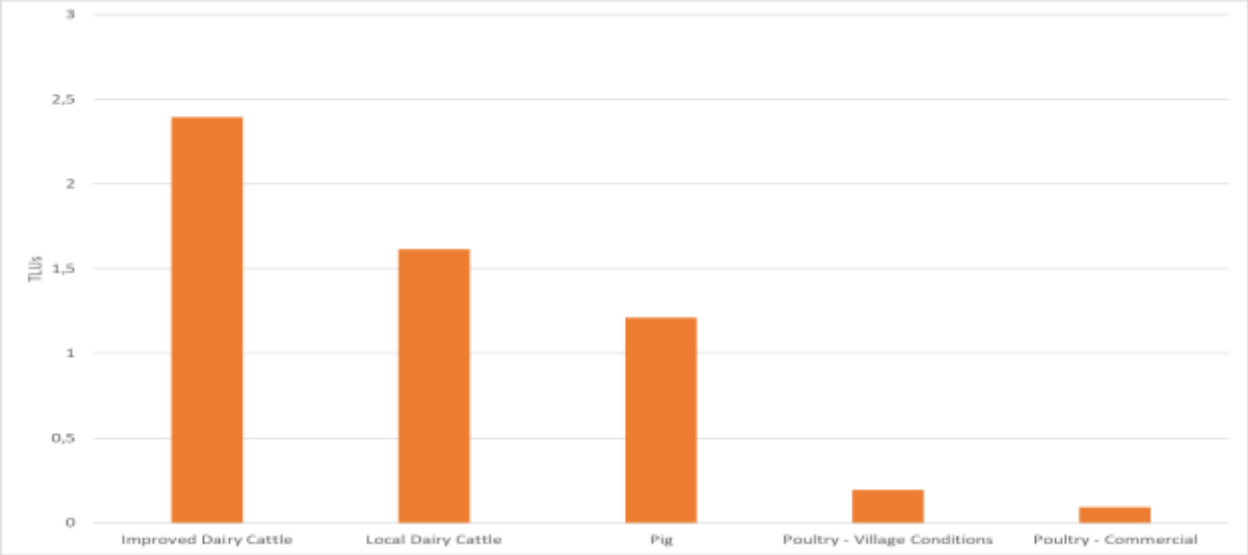

Figure 3: Dominant livestock categories by TLUs per household

Market price trends for livestock and milk

The prices of cattle and sheep fluctuate throughout the year and prices are highest in February and November. Prices are lowest towards the end of December and January as most people sell off their livestock to raise school fees (Figure 4).

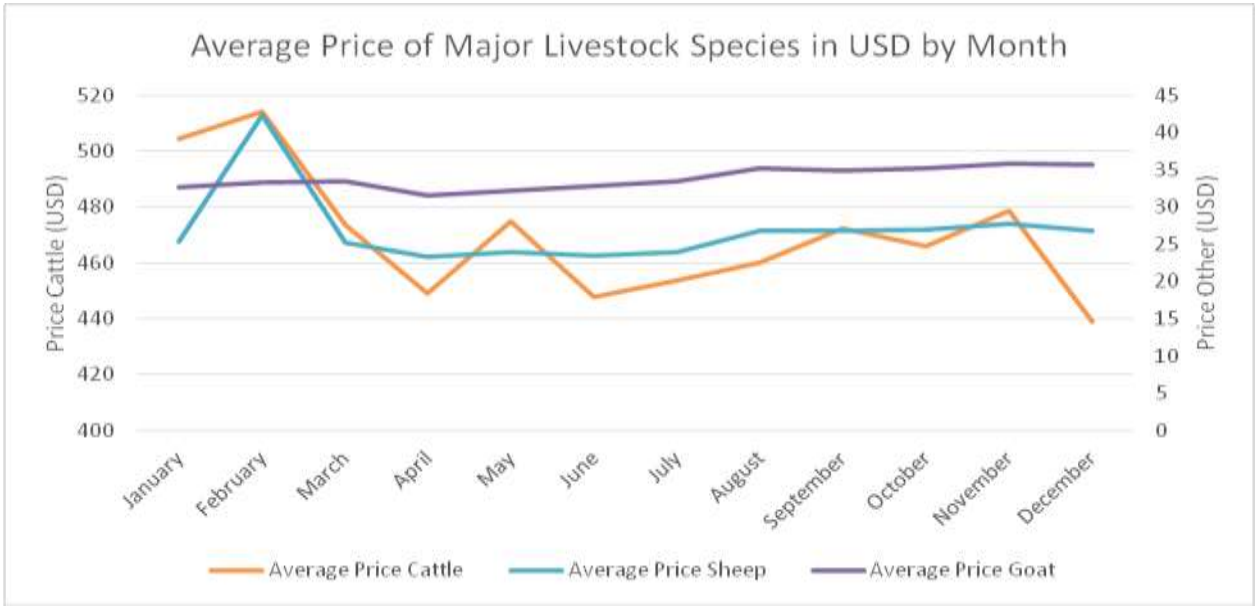

Figure 4: Average price of major livestock species

Milk yield fluctuates throughout the year corresponding to the rainfall pattern and therefore feed availability. Milk prices are constant during the year except for during April when prices are highest (Figure 5).

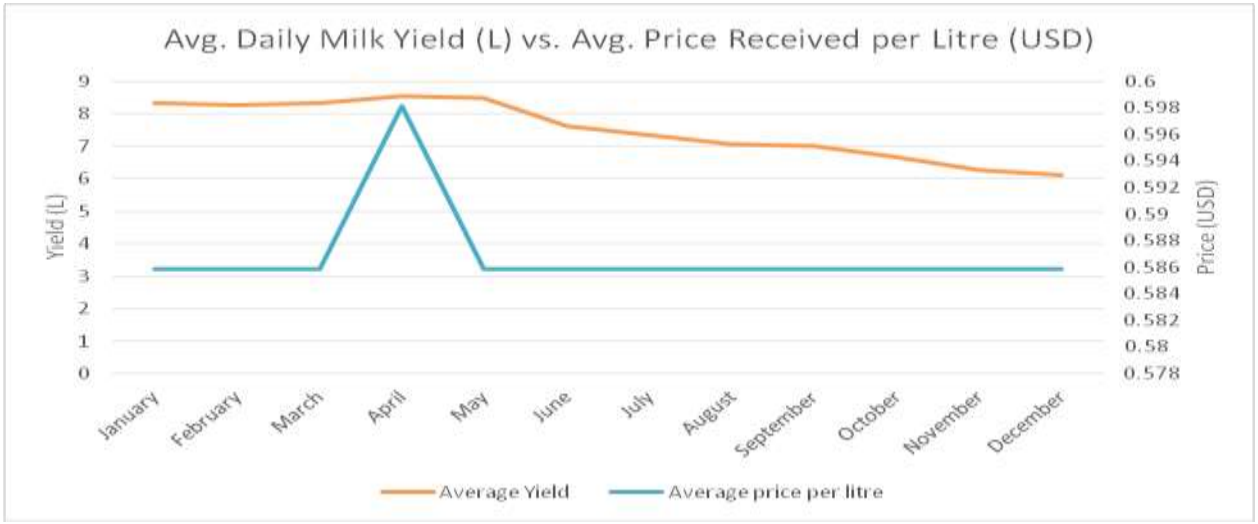

Figure 5: Daily milk yield and price trend over a year

Sources of credit

Credit is available to farmers from banks such as Kenya Commercial, Cooperative, Equity, Kenya Women Trust and Agricultural Finance Corporation. It is the cost of credit and the requisite security that may be prohibitive. Other sources include the International Community Services (ICS) and One Acre Fund (OAF).

The County has also established the Agricultural Development Fund (ADF) which provides credit at 5% interest rate per annum. Other sources are government initiatives such as Women Enterprise, Youth Enterprise and Uwezo Fund. Formal credit comprises to 80% and informal to 20%.

Conditions for obtaining credit include collateral such as title deeds. Age of minimum 18 years and less than 60 years of age. ICS, OAF and KWFT require that you be a member of a group so that other group members become your guarantors. About 40% of the sub-County's households are accessing credit, although around 60% wish to access at any time.

Market and inputs access

There are many local markets in the area and the average distance to reach the marketplaces is 4 km. It costs about KSH 50 (US $0.5) to travel to the market on a motorbike. The roads are fairly good, but some sections become impassable during the rainy season. More roads are being constructed to enable ease of transporting goods.

The FGD members rated the availability of farm input as being fair. Fertilizers, seeds, and agro-chemicals are among the inputs provided by various suppliers (Table 3).

Table 3: Input suppliers by input type

Supplier	Input type
National cereals & produce Board	Fertilizers, seeds.
Dajos enterprises	Certified seeds, Agro-chemicals Agri-equipment, fertilizers
Adungosi farmers Agro vet	Certified seeds, Agrochemicals, Agri-equipment, fertilizers.
Expo Agro vet	Certified seeds, Agrochemicals, Agri-equipment, fertilizers.
One Acre Fund	Seeds, fertilizer & technical training.
ICS	Seeds, fertilizer & technical skills.

Management of livestock species

Housing and feeding

The housing structures used vary with species and the rearing system. Poultry are usually housed in a separate place or accommodated for the night in the family kitchen. Exotic dairy cattle are housed in proper zero-grazing units whereas Zebu cattle are not housed. Commercial pigs are housed in appropriate pig sties whereas the local pigs are left to sleep out-tethered.

Feed troughs are provided where animals are kept under intensive systems. Under the semi-intensive rearing system,(cattle and poultry feed) water troughs are commonly used. Piglets structures are also erected with feed and water troughs. Deep litter system is used for poultry and in isolated cases, dairy cattle are also provided with bedding materials of sawdust or dry grass. Under the intensive system, the dairy cattle, pigs and poultry are housed outdoors. Species like sheep, goats, and local pigs can be housed for the night and are separated by age, species and sex.

Cattle under the intensive system are stall-fed exclusively. Under the semi-intensive system, they are grazed or tethered during the cool hours of the day. The animals usually graze in established paddocks, communal grazing areas or along roads-road side grazing. The style of feeding differs with the season. During the wet season, housed animals are stall-fed on green forage mostly as other animals are grazed in the communal grazing areas. During the dry season, stalled animals may be taken out to graze or fed on silage, hay, maize stovers and straws.

Livestock feed

There are also differences in the style of feeding by animal type. Dairy cattle are mostly stall-fed whereas beef cattle are grazed or tethered. Pigs are also stall-fed. Layers are housed and stall-fed whereas meat birds (broilers) are usually left to scavenge with or without some feed supplementations.

The percentage of farmers that process feed by way of chopping, mixing and urea treatment can be estimated to 70%. Dairy cattle farmers routinely chop Napier grass before feeding to the animals. Only a few poultry farmers mix feeds. The ingredients used include maize bran, maize germ meal, fish meal, soya, and pre-mix. Processing of feeds are estimated to 70% males and 30% females. However, the number of farmers feeding concentrates is estimated at 60%.

The dry season brings many challenges to livestock feeding and farmers overcome these challenges by making use of other feed materials like maize stovers, bean straw and bought in hay or silage. Famers also resort to using of banana stems, tethering and grazing. The dominant feed types purchased by farmers are Napier grass and sugarcane (Figure 6).

Grazing provides the largest proportion of the dry matter (DM), metabolizable energy (ME) and crude protein (CP) requirements of livestock (Figure 7). The contribution of cultivated fodder to DM, ME and CP requirements in the region is low. This calls for increased efforts for the expansion of cultivated fodder crops.

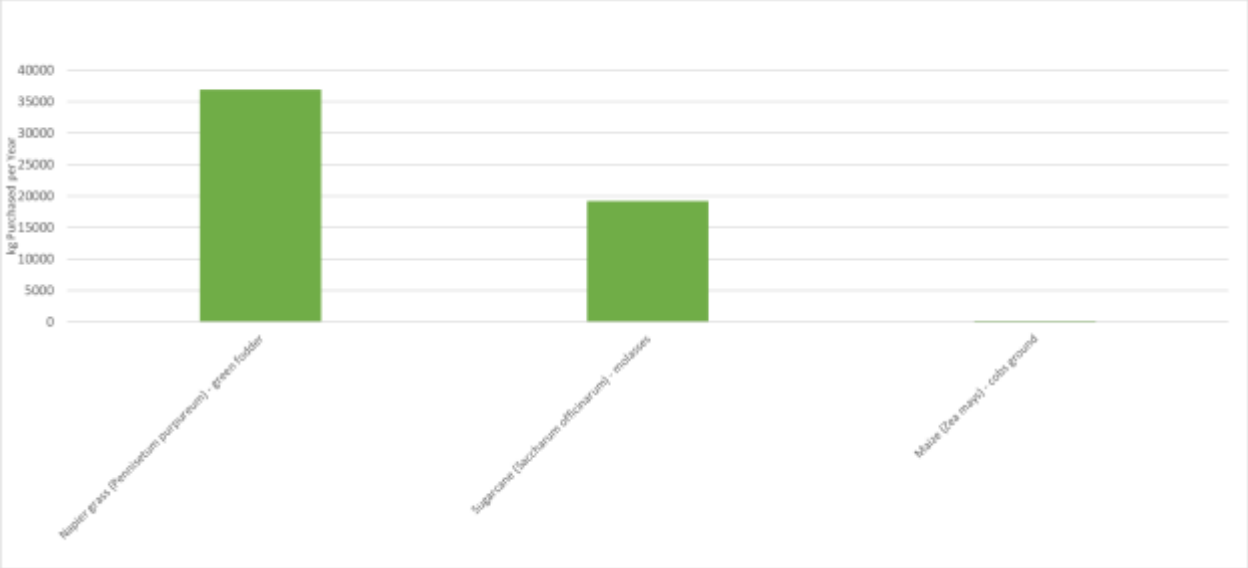

Figure 6: Dominant purchased feed types by kg

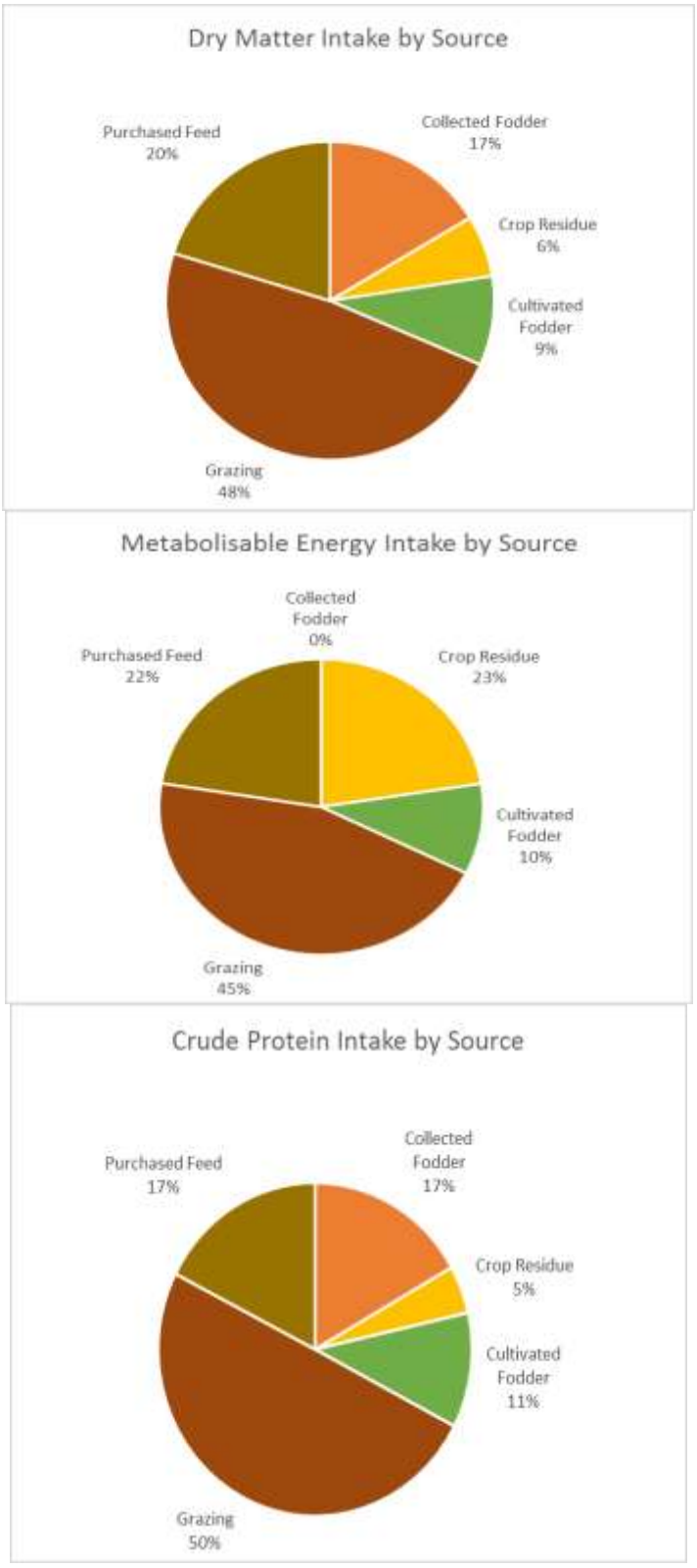

Figure 7A, 7B, 7C: Contribution of different feed resources to dry matter, metabolisable energy and crude protein intake in Teso South sub-County

Animal health services

The livestock sector is dependent on the availability of efficient veterinary services. Most services are rendered by the veterinary department, but its coverage is poor due to poor staff availability. Traditional veterinary practices are rare but are still practised mainly in the treatment of poultry and castration of male animals. The common services offered by the veterinary department are detailed in table 4 below.

Table 4: Veterinary services offered by the veterinary department

Service	Providers	Average distance (km)	Average price (KSH)
Artificial Insemination	County, Nambale dairy Coop	15	1,500
Clinical services	County, Private practitioners	5	1,000
Tick control	County, Private practitioners	5	20 per cow
Disease Surveillance	County, Research bodies	15	Variable
Meat hygiene	County government	5	200

Some of the common health problems in the area that warrant veterinary attention include tick-borne diseases like east coast fever (ECF), Anaplasmosis and heart water, trypanosomiasis, metabolic diseases like bloat, milk fever, mastitis, helminthiasis- worms, dystocia, wounds, and poisoning.

Livestock reproduction methods

Artificial Insemination (AI) and natural services are used for reproduction. About 45% of the farmers use AI while 55% use natural service. There are a few exotic bulls used for breeding and indigenous bulls are mostly used for the Zebu cows. The bull services for dairy cattle are located far apart and sometimes cows in heat have to travel long distances to reach the bull. At times this forces cows in heat to get served along the way by undesired local bulls. The bulls also offer limited choices, may spread sexually transmitted diseases and are expensive to rear. Most of them are vicious and dangerous to keep. Tables 5 and 6 below detail AI and bull service accessibility and efficiency.

Table 5: Artificial insemination service providers, service charges and accessibility

AI providers	Availability rating[1]	Average price (KSH)	Rate of repeat service (%)
Busia Agro-vet	3	1,500	30
Godwin Osimbo	3	1,500	30
Namable Dairy	3	1,500	30
KALRO	3	1,500	30

Table 6: Bull service providers, charges and accessibility

Providers	Bull used	Availability rating[2]	Average price (Kshs)
Maurine Omajo	Fresian	5	500
Francis Erungata	Fresian	5	500
Pauline Auma	Ayrshire	5	500
Inviolata Omudeck	Fresian	5	1000

Key challenges and suggested interventions

The livestock system has some challenges which would need to be addressed in order to improve production. The study identified the major production problems and suggested interventions (as perceived by the farmers) which are shown in Table 7. Lack of access to markets for outputs, feed shortages, and high prevalence of vector-borne livestock diseases are among the challenges mentioned by the FGD members.

[1] Scoring done using 0-4 scales where 0=never available and 4=always available.

[2] Scoring done using 0-5 scales where 0-diffulct and 5= easily available.

Table 7: Livestock production problems and potential solutions

S/No.	Challenges	Suggested intervention
1	Lack of organized/reliable market for milk	Form milk collection centres Join Namable Dairy Cooperative
2	Inadequate livestock feeds	-Bulk fodder to avail seed to the farmers -Plant grass varieties resistant to Napier stunting diseases e.g. Mulato II, Kakamega ouma, Sudan grass, Rhodes grass -Proper management of Napier plots -Feed conservation –silage, hay and crop residues
3	High prevalence of vector born and management diseases	-Proper spraying technologies-use right pumps, correct mixing ratios -Proper cattle management
4	Inadequate extension and veterinary services	-Lobby the county to employ more staff -Seek other alternative extension providers -Conduct farmer-farmer extension services
5	Tick resistance to common acaricides	-Proper mixing of acaricides -Sticking to one a acaricides for sometime -Proper spraying

The above problems were ranked in order of priority using pairwise ranking (Table 8). The pair-wise ranking was done by comparing each problem with every other problem and identifying the number of times a certain problem was identified as the most important. High prevalence of vector-born and management diseases ranked as the top challenges to livestock production in the Teso South sub-County. Poor coverage of extension and veterinary services were the second most important problems identified by the FGD.

Table 8: Pairwise ranking of problems in order of priority

Rank	Challenges
1	High prevalence of vector-borne and management diseases
2	Inadequate extension and veterinary services
3	Inadequate livestock feeds
4	Tick resistance to common accaricides
5	Lack of organized/reliable market for milk

High incidence of vector-borne and management diseases

Teso South sub-county has a high incidence of the tsetse fly and tick populations which make commercial livestock rearing risky and expensive. The government policy on privatization of disease control left the farmers highly exposed to these dangerous vectors resulting in high mortality of livestock. The cattle dips constructed in the early 70s have since fallen into disuse. A possible intervention is the establishment of commercial crush pens to operate using acaricides that eliminate both tsetse and ticks. This is currently undertaken by KENTEC but requires the involvement of more stakeholders.

Inadequate extension and veterinary services

The effect of a high incidence of vector-borne and management diseases are worsened by a lack of adequate extension and veterinary services. The County Government is yet to employ livestock officers and those currently in the office are few and unable to cover the entire area adequately. A possible intervention is for farmers to be organized into clusters and lead farmers trained to provide extension and basic animal health interventions**.**

Inadequate livestock feeds

Livestock feeds are perennially inadequate during the dry spells. There is a need to adopt fodder conservation and irrigation where land is available. Rhodes grass may be grown for cutting and conserving as hay. The high yielding varieties of Brachiaria and Napier grass varieties that are tolerant to stunting disease should also be promoted as alternatives and bulked to bridge feed shortages. Home-based feed compounding should be promoted with the availability of portable feed milling machines.

Tick resistance to common acaricides

There are a few reported cases of tick resistance to acaricides, causing a complex problem as all types of acaricides are in use in the sub-County with no regulations. To address this issue, farmers should be educated on proper mixing or correct use of acaricides.

Lack of organized markets

The challenges related to milk markets are less pronounced around Amukura due to less volumes but is more pronounced around Angorom and the outskirts of Busia. Around Amukura farmers are already delivering their milk to Nambale dairy Cooperative and the appropriate intervention would be to open a collection centre. Farmers should also be trained in value addition in order to increase the milk shelf life and increase its value.

Conclusions

Livestock production is a viable livelihood in Teso South sub-County. Diminishing land sizes and rising human populations means that focus should shift to intensive production systems. The challenge of tsetse and tick menace needs to be addressed through concerted efforts. Farmers should then be assisted to appropriate livestock breeds that are suitable under intensive systems.

The Sub-County has many feed resources that if well harnessed can address the problem of feed shortages. More feed can be grown and conserved to take care of the dry spells. Crop residues should be treated appropriately and fed to livestock.

Milk collection centres should be established in Amukura and Adungosi and the milk delivered to Nambale Dairy Cooperative. In the long run, the farmers can register their own local Cooperative society.

Reference

ILRI (International Livestock Research Institute). 2015. Feed Assessment Tool (FEAST) data application user manual. Nairobi: ILRI.

Annexes

S/No.	Context Attribute	Score (0-4)	Reference
1	Availability of cash	2	Question 1.8 FEAST discussion guide
2	Availability of input delivery	4	Question 1.10 FEAST discussion guide
3	Availability of knowledge	3	Based on facilitator's best judgement
4	Availability of labour	3	Question 1.6 FEAST discussion guide
5	Availability of land for fodder cultivation	1	Question 1.9 FEAST discussion guide
6	Availability of water during the growing season	2	Question 1.5.2 FEAST discussion guide